SCIENCE

FRIDAY, JULY 15, 1887.

THE NUMBER OF ACCIDENTS which occurred on the 4th of July of the present year was very great. In Boston, twenty-seven individuals applied for surgical aid at the City Hospital, and nine beds are occupied by injured persons. At the Massachusetts General Hospital the number is nearly as great. In New York and in Brooklyn there were also very many casualties more. If a description could be given of all these injuries, the picture would be an appaling one. One of the saddest sights we have ever seen was that of a deaf-mute girl whose clothing took fire from a burning pack of fire-crackers which she carried in her pocket. Her back was so severely burned that she was compelled to lie upon her face in bed, and take her nourishment from a vessel while lying in this position. Three days after the receipt of the injury, she developed lockjaw, and died in twelve hours. It is to be hoped that the time is not far distant when the present barbarous method of celebrating Independence Day will be prohibited by law, and the prohibition enforced.

DR. SAMUEL SEXTON has contributed an article to the *Medical Record* on the subject of boxing the ears. He has upon his records fifty-one cases in which the ear has been injured by blows of the open hand or fist. Of these, thirty-one were males, and twenty females. Of the males, thirteen had been boxed upon the right ear, thirteen upon the left, and three upon both ears. One was kicked by a companion upon the left ear while bathing, and the right ear of another was injured by having the head violently squeezed between the hands of another person. Of the females, fourteen were struck upon the left ear, and six upon the right. Five of the women were assaulted by their husbands. Of the entire number, eight were boxed in play, four by school-teachers, two by parents, and one, a fervent lover, by his sweetheart. Several cases occurred among pugilists, and others were due to assaults and brawls. The nature of the injuries varied to a considerable degree. One had inflammation of the ear, with suspicion of intracranial trouble. He had had a running of the ear for twelve years, following a blow upon that organ. This patient subsequently died of brain disease. In another case the ear became inflamed, and the hearing was very much impaired. In still another, the patient was slapped by his father upon the left ear. Immediate pain and deafness followed, with a bloody discharge from the ear. It was three months before this case recovered. The dangers to which Dr. Sexton calls attention are so grave, that parents, teachers, and others should never punish those committed to their charge by boxing the ear.

DO WE WANT AN INTERNATIONAL COPYRIGHT WITH ENGLAND?

THE agitation for an international copyright with England was at its topmost vigor just fifty years ago. It is going on to-day with precisely the same vigor, promoted by the same interest, buttressed by the same arguments, as at its beginning. But meantime the situation has changed. In 1837, when Henry Clay championed a bill for an Anglo-American international copyright in the Senate, all our publishing-houses printed English books without going through the form of asking anybody's permission. All of our magazines were 'cruisers,' using the matter they found in the English monthlies and quarterlies with despotic freedom; and the question, 'Who reads an American book?' was answered with practical unanimity by our own countrymen, 'Nobody.'

To-day we are on the eve of another congressional effort for a bill providing for an Anglo-American international copyright. But what is now the situation? Our publishing-houses publish English books as fast as (and often earlier than) they appear in Great Britain, either by purchasing advance sheets of the British publisher, or reprinting by license. And our magazines find plenty of suitable material offered them at home not only, but quite too much, and so rather discourage voluntary contributions at all, preferring to invite contributions from parties chosen by their editors. The exceptions to these propositions are insignificant; and, even were they larger, they would still be exceptions, from which nothing but the rule can be argued. The only difference between the agitation of to-day and the agitation of 1837 is, that to-day we are told that the reform is desired because American authors are suffering for it, and because the absence of an Anglo-American copyright cheapens and discourages their work; and that it is therefore unpatriotic to further deny it.

Do we want any more books than we have already? What branch of science, or literature, or art, is suffering? From what quarter comes complaint of a dearth of books? Courts are established for the trial of controversies between man and man. Were there no litigation, there would be no courts. And yet one of the horn-book and capital maxims of court is, that 'it is to the interest of the public that there should be an end of litigation,'—a maxim which is interpreted to mean that compromises and quietings of actions between parties (statutes of limitation, or any discretion of a court tending to discontinuances of lawsuits) will always be encouraged. Are we not coming to the time when there will be some such a paraphrase of this maxim as that 'it is to the interest of literature that there shall be an end to books'? Certainly the groaning columns of our book-stores begin to bewilder us with their profusion of literary wares, and suggest a question as to how much of all this mass is, after all, literature. How much of it will be on these shelves a year, or even a month, from now, or will have been packed down in the cellars below, or turned over to the paper-stock men in the Ann Streets of our great centres?

If it should prove, for example, to be the fact that a couple of dozen men in the United States do all the writing for our American magazines, whose business would it be, except that of the public,—who buy those magazines or not, entirely as they please? Magazines are not edited, have not for the last ten years been edited, as of old, by voluntary contributions. The editor knows what his readers want, and writes to employ just what writers they want. He saves his reading of manuscripts, thus conserving his eyesight as well as his judgment. If some of our magazine-editors would just once print some of the manuscript they do receive from voluntary correspondents,—just as they receive them, with the orthography, etymology, syntax and prosody, punctuation, and so forth, precisely as their authors send them,—I think our public would be convinced that the editors are right in the policy they pursue. And I do not suppose the magazine-purchasing public would very largely clamor for a second effort, on the editors' part, to 'recognize voluntary contributors.' Add to this the fact that a large percentage of the voluntary contributors to our magazines,—convinced that a conspiracy exists among all magazine-editors to reject their manuscript,—'get their blood up,' so to speak, and print at their own expense in pamphlet or book form, and we derive some idea of the causes which are at work to load down our booksellers' counters. It seems to me that the world of readers will be more apt to ask for a law which will restrict, rather than for one which will increase, the publishing of books; and that they would look less askance at the proposal for an Anglo-American copyright law if assured that it would curtail, rather than exaggerate, the present deluge of printed and published matter.

Another change in the situation since the early agitation for English

international copyright lies in the fact that the daily newspaper, which sells for a couple of coppers, is no longer merely a bulletin of the telegraphic news and market reports, but furnishes daily a volume of reading-matter with which the bookseller must compete sooner or later. Add to this (we can go on adding here for a long time yet) that the articles in the newspapers and the periodicals of more lasting value will surely be printed in book form; and, if not of permanent value, a very large percentage of them will arrive at the same disposition by reason of the collective pride of the authors ("By request of numerous friends who desire to see them in more permanent form," is the stereotype here), — and the prospect for more books than we need soon becomes bewildering. And these books, too, are bound to be dilutions of other dilutions in combination; for the original atom which is to be added, at the best can be but small compared to the vast centuries of literature behind each successive book.

Now, in all this maze of things, the publisher is really in the same position as the editor of the magazine. He can bring out the untried manuscripts of his fellow-countrymen, and run the risk of selling enough copies of the venture to grow rich therefrom; or he can take the English books which he knows will sell, which the newspapers and periodicals of the world are advertising for him, and run no risk. He avoids the expenses of proof-reading and correction by buying advance sheets; and since he publishes for the same reason that authors write, — to accumulate a competency, and meanwhile to support himself until he does accumulate it, — we can hardly blame him, because, already once in print, the author or owner of the English book can deal with him on better terms than the American author.

In answering the question as to whether we really want an international copyright, I should like to consider it under two propositions; namely, (1) whether our own authors need it, and (2) whether the British authors need it (and, if yea to the latter, how we can give it to them at all). In answering these questions, I would like to premise, first, that personally I am in favor of an international copyright with England; that I am not only in favor of, but some years ago labored hard to secure, one (at my own expense), and contributed money to assist the labors of others in the same direction. Nay, further, I once devised a plan by which a case should be constructed, like the celebrated greenback case, wherein an English citizen should write and publish a book in this country, an American publisher pirate and print it, and the Englishman begin an action for the infringement and an accounting; and so go up to the Supreme Court of the United States on the question whether the Constitution of the United States by its exact words, or by any statute enacted by virtue of such exact words or grant of power therein clothed, did forbid, or deny in this single instance, the natural right which every man has to his own, — to his property. And I may add (in self-defence, lest what I am led to say in this paper may look as if I am of different mind now from what I was then) that I believe the abstract act of printing for gain, without license therefor, of literary matter one has not produced and which belongs to another, is larceny, pure and simple, and therefore without color of moral excuse.

Let us examine the second question, as to the British author, first. If an Englishman brings his horse to this country, it does not become the less his horse. If I break in upon that Englishman's stables and appropriate that horse, it is horse-stealing on my part; and if I use the horse so appropriated, and earn money by using it, and present the Englishman with a portion of my winnings, I am none the less a stealer of horses. Similarly, if a publisher takes an Englishman's book without the Englishman's consent, and publishes it, he has appropriated what does not belong to him; and if the book so republished sell, and the publisher presents the Englishman with a portion of the proceeds of the sales (or with the entire proceeds, for that matter), the fact that the publisher has appropriated what does not belong to him, and so committed an immoral act, is not affected in the least. But, unfortunately, it is one of the accompaniments of the curse of Adam that nations must legislate for their own people, and make treaties with each other on only the one principle, the selfish principle, of expediency, — of what is expedient to themselves and to their own people. Indeed, no attempt has ever been made, so far as I am aware, to maintain nations on purely moral grounds. No nation that I am aware of, on being invaded by a foreign foe, has said, "You are right, we are morally wrong, therefore we will not fight you: take our nation, we have erred, and deserve to lose our homes." And, to go a little further, no nation that I am aware of has ever enacted laws for the benefit of citizens of another nation, or even for the benefit of a certain class or guild, or association of citizens of another nation, simply because it was morally right that such laws should be passed, or because the citizens of that country, or class, or guild, or association thereof, had really a moral right to something which the fact that they were not citizens of the nation enacting the laws had theretofore withheld from them. Could or would the British Parliament enact a law for the benefit of American statesmen, or American lawyers, or American physicians, without the comment that one man was as good as another, and that if Parliament proposed to give American statesmen, or lawyers, or physicians, equal rights with English subjects in England, the law should be for the benefit of all Americans, whatever the profession by which they earned their bread, not for a single class thereof, since the Law should be no respecter of persons? Clearly, the English author can only petition the American Congress for a statute of Anglo-American international copyright on the ground that he is a man, and that it is wrong to take his property without his consent; and the only answer to that statement will be, that the laws of national expediency do not, *prima facie*, permit a nation to pass statutes to secure special justice to a special class of aliens, although it is equally true that no civilized nation denies equal justice, under its general laws, to any man by reason of his alienage.

Second, so far as the American author is concerned, I apprehend that one reason why Congress cannot pass a statute of Anglo-American international copyright on the petition of American authors is because Americans can not (or at least because they do not) present a case, or at least a grievance, upon which Congress can act. Legislatures in constitutional countries can no more enact statutes than courts can find judgments or issue decrees, without a statement of facts, positive and special: neither the Legislature nor the court can act upon mere generalities. And generalities are all that our American authors can present (or at least have so far presented) to Congress. When any one, or one hundred, American authors can show to Congress that anybody is being specially damaged by the absence of such a statute as they pray for, then the time will come for the showing to be legislated upon. Let the petition recite that A is, and always has been, an American author; that he is dependent upon his trade or profession of authorship for his daily bread; that he cannot earn any money for his authorship unless he can secure a publisher; that he cannot secure a publisher, although he has made every effort in good faith; and that he is informed, and believes, that the reason why he cannot secure a publisher is because Congress has hitherto neglected or refused to pass a statute enacting an Anglo-American international copyright. On such a showing as that, Congress could act: could appoint a committee to inquire into the facts, and, if found as stated, report a bill for the relief of A. But is it not the fact, that, while any number of American authors are willing to sign a round-robin at any time for an Anglo-American international copyright, no single author has ever been known to come forward and make such a petition, or show such a loss or grievance, anywhere or to anybody?

Or if the round-robin of American authors could join in a petition of another sort: Let A, B, C, and D respectfully show that they are citizens of the United States; that, by reason of the neglect or failure of Congress to pass a statute enacting an Anglo-American international copyright, there is a dearth of books, or magazines, or other published matter in the United States; and that by reason of this dearth of books they cannot pursue their studies, or procure reading-matter for themselves or their families; that they are, by reason of this state of things, suffering great loss and hardship, etc., — there, again, would be a state of facts into which Congress could inquire, and, if found *bona fide*, could legislate. But I am afraid that this last round-robin would have hardly a leg to stand on, in the current year at least, from the fact that in the office of the Librarian of Congress, the legal depository for copyrights, the entries have footed up to 31,229, of which 4,676 were for bound volumes, being an increase of 588 over any previous year, as I learn

from the Librarian of Congress. If, therefore, Congress cannot find any individual to say that he is a sufferer by the present state of affairs, and cannot find anybody to depose that the country is suffering, where is the case to meet which, or the hardship to remove which, Congress can act?

As to the constitutional powers of Congress to pass laws resulting in an admission of Englishmen to full privileges of our laws so far as the protection of literary property is concerned, perhaps a word may be said; though, from the above considerations, it would hardly affect the fact, that, however constitutional the action to be taken, Congress must have some pretext upon which to base their action.

When the Constitution of the United States was framed, it gave Congress power to pass laws 'to promote the progress of science and the useful arts' by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries. It is argued, that, — since the words used are, 'to promote science and the useful arts,'— this clause must be construed to mean that the framers were not thinking particularly of the citizens of the Republic, but rather of the sciences and the useful arts, in their anxiety that the new commonwealth should grow in intelligence and intellectual strength. But, since the presumption is always that a State legislates for the benefit of its own citizens first, even before it legislates for the abstract benefit of arts and sciences; and for the practical worldly prosperity, safety, and peace and tranquillity of its citizens, even before conservation of their intellectuality, — something more, I suppose, than abstract argument will be required by Congress before it will be satisfied that those presumptions have been disposed of, and the constitutional clause sufficiently widened for them to act upon a generality.

Commercially speaking, questions of copyright as a matter of fact are at present of very minor importance in the jurisprudence of the United States. As a matter of exact calculation, decisions upon questions of literary property do not occupy one sixty-fifth of one per cent of the time of our courts. It is impossible to deny that such a consideration as this may, in its turn, have some effect upon the indisposition of Congress to legislate upon questions of copyright; though that it can militate in the slightest against the right of every man to his own, of course nobody can pretend for a moment. The real value of the subject, being thus appraised by the despotic laws of trade and of supply and demand, need not be further assessed. But I have no doubt but that the great resources of the English language, and the perfect ease and impunity with which any literary work can be pirated by paraphrase, have something to do with this estimate. Eleven years ago I myself prepared a legal treatise on this very subject of copyright, and my publishers issued it in two octavo volumes of some fifteen hundred pages. Since copyright cases rarely appear in the digests, and only occasionally in the reports (being mostly settled, if they get into court at all, at special term), I was at the pains of considerable servile labor in collecting my cases at first-hand from counsel and the court records. But no sooner had my book appeared, than a general writer for the press, who, among other lucubrations, had been favoring a popular weekly with dissertations to the effect that copyright should not exist and be limited by statute at all, but by common law, and so be perpetual,— and that therefore the law was a robber and a villain,— gathered up these dissertations, and bound them, along with my cases, into a book; which, as it came later than mine, by the inexorable law-book rule, superseded it. To conceal the plagiarism, this last writer was at great pains to display in his volume a list of the authorities he had consulted, taking in authors a century or so back, but carefully omitting my work of the year before (which he, however, reviewed at great length in a daily newspaper), out of which he had nevertheless obtained all his recent, and the bulk of his valuable, material. Now, here was no apparent nor technical piracy, — nothing against which I could demur, or courts relieve. The example has survived its importance, and (since the last-coming volume is already effete) lawyers have so rarely occasion to open it, that I doubt if they have even discovered that its letter-press reads one way, and the cases it cites another. But I recall it here to show how small, at the most, is the real protection an author gets from the act of taking out a copyright; and how easily even technical matter can be pirated with impunity. But when it comes to general propositions the protection vanishes altogether; for we can equally well say, 'the sun shines' or 'the orb of day illuminates,' 'the rain falls' or 'it rains,' 'gravity controls' or 'the attraction of gravitation governs,' 'the statute provides' or 'it is enacted by the statute,' etc.; and a very little ingenuity indeed will suffice to make a later book entirely entitled to copyright, while actually, consecutively, and unblushingly pirating the entire contents of its most recent predecessor by the simple and artless process of paraphrasing it. Certainly there is no law, rule, or custom of the copyright bureau to prevent; no oath of originality, novelty, or utility is required, as in the case of application for a patent. Anybody can mail a titlepage and fifty cents to the Librarian of Congress, and, on publication of his matter, two printed copies of something whose drift or contents corresponds to that titlepage; and this,— entirely irrespective of the source, authorship, proprietorship, or character of the matter forwarded,— gives a complete copyright under our statutes. Under such trivial, almost childish conditions, is it worth while to inquire exactly what franchises we are proposing to enlarge, or whether, on enforcing them, the constant and inevitable percentage of evasion will be increased or lessened? Our present statutes of copyright give the very minimum of protection, at the very maximum of expense; but the amendment they need is not just now, perhaps, in an international direction. For the American author, however, they do afford a certain amount of security, from the very fact of their being upon the statute-books; while, as to the English author, the purchase by our publishers of advance sheets — which, by the constantly decreasing time-distance between New York and London, is becoming much the cheapest thing our high-class publishing-houses can do — makes almost any piracy on this side labor under the great disadvantage of delay and a remainder-market already supplied. And as to the piracy of current standard works, we can, of course, pass no *ex post facto* laws.

Again: British authors have never ceased, I think, to press with whatever interest here they could muster, for international copyright between their own country and ours. But it is only since a remarkable series of letters by the late Charles Reade, addressed (about twelve years ago) to a New York City daily newspaper, — claiming that American authors suffered more than English ones by non-international copyright relations between the two countries, — that American authors have been found sending in their round-robins and petitions for a treaty or a statute securing such comity. Are our American authors quite sure that Mr. Charles Reade was entirely disinterested, or, as he claimed to be, entirely devoted to the interests of American authors, when he wrote? That it was not only a new tack, after all, from the English standpoint? Are American authors quite sure, if English authors could copyright over here, that American publishers would not still prefer the English to the home author; that he would not, perhaps, write quite as interesting novels and quite as competent text-books; that from King Log our American author would not find he had been appealing to King Stork?

As a matter of fact, there are numerically very few publishing-houses indeed at present engaged in reprinting English copyrighted books without English license. And by actual examination of the trade-lists of these, moreover, I find that they are publishing mostly such books as are called 'standard;' namely, the works of English anthology, letters, and science, from Shakspeare, Bacon, Locke, Newton, and the like, down to Tennyson, Browning, Darwin, Huxley, Tyndall; which latter (simply because they do not sell popularly, with the exception, perhaps, of Tennyson) they do not reprint at all. Now, although the descendants of William Shakspeare, could we find them, have a perfect copyright at common law in their ancestor's plays (for there were no statutes of copyright in William's day, and what is now American was English soil), there is no claim in that quarter for our publishers to sin against; and it is only the living English authors, mostly the novelists, who are moving for international comity. Now, the English novelists are a fraternity to which we owe a good deal in this country. For my own part, I would miss a large fraction of the amenities of existence without them. But the question is, are they a large enough body politically and economically, from an international point of view, to justify treaties or other international legislation,

especially since no such legislation can be retroactive so as to compensate them for past losses?

As to American literature, I may repeat, that the constitutional right of Congress to provide an international copyright with England is based on the constitutional clause, when interpreted to mean that Congress has the right, not to encourage authors *quoad* authors, but to encourage the growth of literature and the arts *per se*; and this (though I have them not by me) I understood to be the gist of the arguments of my esteemed friend, E. L. Andrews, Esq., before a committee from one of the houses of Congress, and of Mr. Thorvald Solberg in a late letter to *Science*. I rather doubt, myself, if the framers of the Constitution were thinking, at that precise date, of future flights in literature and art, instead of the new born nation for which they were drafting organic laws, or if the presumption is not that they were thinking of the latter; but, at any rate, I am of opinion that the absence of an international copyright with England is rather more of an incentive to emulation on the part of our American authors than its presence could possibly be. Just as the highest standard produces the highest scholarship, so, it seems to me, the fact that, other things being equal, the American publisher prefers to print the Englishman's work rather than the American's, is a tremendous inducement to the American to make things *un*equal in his own favor. Said a writer of novels, an American, to me the other evening, "The public buy novels, — not your novels, nor my novels, but novels, — and I ought not to be obliged to compete with stolen goods. — But if that be the case," said I, "it appears that you are not competing with stolen goods necessarily, but with your brother novel-writers. Stolen goods are the accident, no doubt, of your trade, but not to a larger proportion than of any other trade. Your remedy, it seems to me, is not to petition for international copyright, but to give your goods such a character and reputation that consumers will take none but yours. If you assume a commercial standpoint, you must take the consequences of it."

However, in dealing with the guild of authorship, we must never forget that all the members, indiscriminately, of that guild, deserve our grateful recognition; and this is equally, I think, the public sentiment of this continent; and besides, as to any of the craft, alien or native, in these questions one should always remember that authors and dealers in literary property do not exactly stand upon a bread-and-butter basis. As to the author, he is a gentleman who has deliberately selected the worst-paid and least-thanked of the professions, — a profession which not only attracts the minimum of commercial attention, but practically unfits him for ever leaving its walks for any other, — and therefore he should be treated, if not with that benign munificence which the law extends to sailors and infants, at least with the consideration and self-abnegation of his fellow-men.

So far as the question of an international copyright with England goes, I personally have never abandoned my belief in its righteousness. However doubtful of the constitutional powers of Congress to enact one by special statute, I am able to see no reason why the present statute cannot be amended (say, by substitution of the word 'person' for the words 'citizen of the United States') so as to practically enact one: or treaty made with Great Britain, which, under the treaty-making power, might shield itself from any judicial question whatever. As to an international copyright with France, Germany, or other continental nation, it is needless to add, the considerations I have suggested above do not in any wise apply.

APPLETON MORGAN.

THE INCREASE OF STATE INTERFERENCE IN THE UNITED STATES. — III.

WE have now before us what is said in a general way by representative men among the economists and students of political science with respect to the character of recent legislation, so far as it bears upon the question as to the increase of State interference. We have sufficient data to justify the opinion that laws having a tendency to interference are on the increase, and that this increase is pretty general throughout the country. It remains to discuss the views entertained by our correspondents as to the advisability of such legislation. These views are extremely diverse, and show very clearly the absence of any organized body of widely influential economic thought in this country. Sixteen per cent of our correspondents are unreservedly in favor of the unlimited extension of State control: they are therefore logically State socialists. We believe, however, that this proportion is far larger than that which obtains among either professed economists or the people at large. Twenty-seven per cent of our correspondents are in a general way favorable to the extension of State control, but would guard such extension carefully. Twenty-four per cent view State control with disfavor as a principle, but would admit it in certain cases. Thirty per cent are unreservedly, some of them violently, opposed to State control, and express themselves with much directness and force. A comparatively small number rest their opposition on *laissez-faire* as an economic doctrine, the larger number assigning other reasons. Three per cent express no opinion, and are therefore classed as non-committal.

In noticing the able pamphlet of Prof. Henry C. Adams, 'The Relation of the State to Industrial Action' (*Science*, ix. No. 222), we pointed out that he lays down three guiding principles for the regulation of State interference. It will be well to recall these principles, and keep them in mind for comparison with what is said on the subject by others. The principles referred to were, (1) the State may determine the plane of competitive action, (2) the State may realize for society the benefits of monopoly, (3) social harmony may be restored by extending the duties of the State.

Professor Cooper of Carleton College, Minnesota, says, "I believe the State should interfere to control powerful monopolies, but this power cannot be wisely used by such men as are chosen to our State Legislatures."

Frank R. Morrisey of the Omaha (Neb.) *Herald* strongly opposes State interference. He would check it by "the education of public sentiment to the fallibility of majorities through the columns of the press, the pulpit and the rostrum, infusing a broader knowledge of the privileges of personal liberty, and impressing upon the citizen the necessity for the consideration of every other citizen's opinions."

William Alvord of San Francisco believes in amendments to the State constitutions, forbidding the enactment of local or special laws. He says, that, since the adoption of the new California constitution, the bound volumes of session-laws have decreased from over 1,000 pages to 270 pages or thereabouts.

Prof. Jesse Macy despairs of any reform so long as thinkers and teachers beat the air, and keep out of speaking-distance with the people who are in governmental difficulties.

Prof. Henry C. Adams thinks that the increasing attention now being devoted to political science will in time produce less unsatisfactory legislation.

C. Caverno, Esq., of Lombard, Ill., is very optimistic. He finds in the increasing interference only renewed adaptation to the social environment. "In my judgment," he tells us, "our legislation is predominantly wholesome: the work of man rarely appears to so good advantage as therein."

Herbert L. Osgood of Brooklyn, N.Y., says, "Take the world over, political theories at the present time tend strongly toward the advocacy of more State interference. This is doubtless in response to a real need. The statutes of this nation, as well as those of Europe, will probably yield to this impulse to a certain extent; but theories always far outrun practice. The Republic does not necessarily lead toward individual freedom, but the spirit of private enterprise is too strongly developed in this country to yield to a paternal government. I believe the restrictions upon the freedom of the individual coming from public opinion and social custom are in this country more dangerous than those to be feared from the laws."

Assemblyman E. H. Crosby of New York City believes that the increase of legislative interference is the result of a popular demand for it. This demand, to be intelligent, must be directed by sound political science, and the dissemination of this is the need of the hour.

Morris F. Tyler of Connecticut is a representative of those who think that unlimited *laissez-faire* will work a cure in time. Prof. A. T. Hadley does not believe it worth while to try to check it, but would let extremists pass such laws as they please. These could not be enforced, and would either be repealed or become a

dead letter. Prof. John B. Clark of Smith College would trust to political education. "The specific point," he says, "in which intelligence can do the most immediate good, is in the labor-organizations from which the political pressure proceeds."

The Chicago *Tribune* sends us the following: "The *Tribune* holds that restrictive legislation is not only advisable, but necessary, though admitting it may be carried too far, and has often been overdone in the past. You have doubtless noticed that the relative breadth of restrictive legislation varies with the development of civilization in a community. At first all is arbitrary, each offence being treated on what the judge or judges (maybe dictator or plebiscite) regard as the merits of the individual case, without regard to precedent. As the community grows, the tendency is to swing towards the other extreme, and the resulting over-legislation is more slowly corrected. Bad laws are repealed, good ones consolidated, and special legislation forbidden for the future by constitutional enactment. These three phases may be said to be approximately represented by the mining-camp in this country, the frontier State, and the older State. Illinois is a senior of Minnesota in the family of States, and may therefore be expected to be less paternal in legislation. And there is reason to believe that a careful comparison of the two would show this to be the fact. Undoubtedly the best form of government, and we may even say the ideal one, is that in which an appeal to the common law would suffice as a rule of action in all courts, and its interpretation be found adequate to the punishment of wrong-doing by any member of the community, however prominent he may be. But no State in the Union has yet reached the stage where this could be depended upon; and, till this has been attained by a process of slow growth, it seems to be necessary to resort to some kind of special legislation to provide against new forms of wrong doing which every now and then crop out in the race between conscientiousness and rascality."

Prof. E. J. James prefers to secure better legislation by improving the grade of legislators. He would not "restrict the power to Legislatures to do much good, for fear they may do some harm," by constitutional amendments.

The replies mentioned above are fairly typical of the divergent views presented. Had space permitted, we should have been glad to produce more of our replies in full. But our end is gained if we shall have succeeded in directing thoughtful attention to the tendency developing among us. As Dr. Shaw says in his original article, we think we are proceeding on one economic theory, but our actual legislation is in direct opposition to that theory. We are not asking for a restoration of *laissez-faire;* but we should like to know whether this perpetual running to the Legislature for purely private enactments meets with the approval of the thinking men of the country. We do not believe that it does. We believe, with Professor Perry of Williams College, that interference results from the attempts, often successful, of individuals to accomplish, in the name of the State, their own personal ambitions and desires. We believe that when the people at large realize the extent to which paternalism in legislation has developed, they will declare themselves with no uncertain sound as in favor of the fundamental American principle of individual liberty and individual responsibility. They will just as emphatically refuse to permit the State's power to be prostituted to personal ends.

HEALTH MATTERS.

Preventive Medicine.

IN an address on the recent advances in preventive medicine, delivered at the thirty-eighth annual meeting of the American Medical Association, Dr. G. H. Rohé stated that the danger of an invasion of this country by cholera was greater than it had been at any time during the past three years. The United States are threatened from three sources: first, from Europe, by way of the Atlantic Ocean; second from Japan, by way of the Pacific; and, third, from the west coast of South America, by way of the Pacific, or by way of Mexico and our southern border. The Isthmus of Panama and the South Atlantic lines of transportation may also act as gateways to the infection.

In this address, Dr. Rohé refers to the researches of Shakspeare, Koch, and Pettenkofer into the relations between cholera and its bacillus or spirillum. He also alludes to the claims of Freire of Brazil, and Carmona of Mexico, concerning protective inoculations against yellow-fever, and to the fact that these claims are now being investigated by Dr. Sternberg, under the authority of the president. A brief history is given of the cases of scarlet-fever which have occurred in England, apparently having their origin in milk from diseased cows. We have already mentioned these cases and the able investigation of them by Mr. W. H. Power of the English local government board. The subjects of tuberculosis and typhoid-fever also receive attention.

Decided advances have been made in the disposal of the refuse of cities. The cremation of garbage has been carried out at Montreal, Canada, and at Wheeling, W.Va. The irrigation system of sewage-disposal has been greatly extended in Germany. In Berlin it has given great satisfaction, the sewage of 900,000 people being carried to irrigation-fields, and the water which drains off being submitted to chemical examination for evidences of pollution, which were discovered but once during an entire year. The objection that this system of sewage-treatment is not applicable in cold climates is invalid, as is shown by the results in Pullman, Ill., and in Dantzig, Germany. Birmingham, England, with a population of 600,000, has adopted the irrigation system, and the income realized during 1885 from the sale of stock and produce from the sewage-farm amounted to over $100,000.

During the past year the poisonous effects of tyrotoxicon, discovered by Professor Vaughan, have been witnessed repeatedly in persons who have taken milk and ice-cream. Professor Vaughan has made the suggestion that this ptomaine may be the active cause of cholera-infantum. The question of public baths is treated very fully in the address. Public, like private, bathing institutions must make provision for individual baths. Large pools, in which many persons bathe at once, fail to answer the requirements of sanitary science or of public decency. A French army surgeon, Duval, has overcome this difficulty, and now both the French and German soldiers have proper facilities for bathing. The latter are required to bathe every week, the government furnishing the bath-room, warm water, soap, and towels. In our army and navy no steps have been taken to introduce this reform, although Dr. Billings has shown its feasibility. Dr. Lassar of Berlin has demonstrated the practicability of separate bath-rooms in connection with public bathing, and has been urging the extension of the military system to the civil population, so that every German may have his weekly bath. He gives excellent illustrations of the practical benefits to be derived from the adoption of such a system. At the white-lead works in Ehrenfeld, the eighty employees are required to bathe weekly, the facilities being furnished by the proprietor. In the first year, 1884, the sickness was reduced twenty per cent, and in 1885 it was reduced still lower, fifty per cent. In certain dye-works in Berlin, ten rooms, containing shower-baths, have been provided for workmen and their families, and for all who desire to use them. In Göttingen, with a population of 21,000, of which number 3,000 are children who attend the public schools, baths are fitted up in the basement of one of the school-houses. A class of fifty can bathe in an hour. Each child has the opportunity of bathing once in two weeks, and seventy-five per cent of the children avail themselves of it. The authorities and teachers are unanimous upon the point that the system is of great benefit to the children, not only from its direct sanitary advantage, but from the habits of cleanliness formed, to which they are likely to adhere through life. The only cities in the United States having public baths are, Boston, with 17; New York, 15; Philadelphia, 5; Brooklyn, 3; Cleveland and Hartford, each 1; and Buffalo, the number not given. In New York, 3,431,086 persons bathed from June to October in 1883; during the same time in Boston, 959,765; and in Brooklyn, 225,885. In eighteen cities where there are no public baths, only about twenty-three per cent of the residences are supplied with bath-tubs.

Dr. Rohé concludes his address with a statement of some of the results of the application of sanitary measures, quoting the statistics of Dr. Baker in Michigan, and Dr. Ogle in Great Britain. The address is an admirable *résumé* of what has been done in the realm of preventive medicine, and no one can read it without being impressed with the great strides which have recently been made in this field of research.

WHAT TO EAT WITH TEA AND COFFEE. — In the *Journal of Anatomy and Physiology*, Dr. J. W. Fraser reports the results of his experiments on the action of tea, coffee, and cocoa on stomach and intestinal digestion. He summarizes his views by the following recommendations and deductions: 1. That it is better not to eat most albuminoid food-stuffs at the same time as infused beverages are taken; for it has been shown that their digestion will in most cases be retarded, though there are possibly exceptions. Absorption may be rendered more rapid, but there is a loss of nutritive substance. On the other hand, the digestion of starchy food appears to be assisted by tea and coffee; and gluten, the albuminoid of flour, has been seen to be the principle least retarded in digestion by tea, and it only comes third with cocoa, while coffee has apparently a much greater retarding action on it. From this it appears that bread is the natural accompaniment of tea and cocoa when used as the beverages at a meal. Perhaps the action of coffee is the reason why, in this country, it is usually drunk alone or at breakfast, — a meal which consists much of meat, and of meats (egg and salt meats) which are not much retarded in digestion by coffee. 2. That eggs are the best form of animal food to be taken along with infused beverages, and that apparently they are best lightly boiled if tea, hard boiled if coffee or cocoa, is the beverage. 3. That the caseine of the milk and cream taken with the beverages is probably absorbed in a large degree from the stomach, and that the butter used with bread undergoes digestion more slowly in the presence of tea, but more quickly in the presence of coffee or cocoa; that is, if the fats of butter are influenced in a way similar to oleine. 4. That the use of coffee or cocoa as excipients for cod-liver oil, etc., appears not only to depend on their pronounced tastes, but also on their action in assisting the digestion of fats.

CONSUMPTION. — At the recent meeting of the American Climatological Association held in Baltimore, the discussion of pulmonary consumption occupied an important position. The address of the president, Dr. F. Donaldson, sen., was on the prophylactic treatment of those who inherit a predisposition to phthisis. He thinks that we are justified in assuming from statistics that this disease is diminishing. In England there has been a gain in males of fourteen per cent, and in females of twenty-two per cent, while in Massachusetts there has been a gain of fifty-four lives in every hundred thousand. Thirty per cent of the cases have an inherited predisposition to the disease. This hereditary form, when developed, offers the least prospect of recovery. He regards the acceptance of Koch's bacillus as well-nigh universal. Its constant presence in phthisis must be accepted as the full explanation of the manifestation of tuberculosis. Persons who are predisposed to the disease may develop it by the inhalation of the dried bacillus from the expectoration of diseased persons. The prophylactic treatment embraces two elements: (1) the improvement of the general health of the subject, and (2) the protection from contagion. The tuberculous mother should not nurse her child, but, if possible, it should be given to a healthy wet-nurse. The hygiene of the nursery should be looked after carefully. The room should be well ventilated, and kept at a comparatively low temperature. The subject should live much out of doors, especially between the ages of fifteen and twenty years. The beneficial effect of sunlight should be borne in mind. The physical form of the chest should be enlarged by gymnastic movements. If possible, life should be passed in high altitudes. Oleaginous fluids are useful if they can be digested. The milk and flesh of tuberculous animals must be avoided, for cooking rarely destroys the bacilli of beef. If the prophylactic treatment is thoroughly carried out, the hereditary proclivity may remain latent, and the individual never contract the disease. In the discussion of the general subject, Dr. Bruen considered that in tubercular phthisis the influence of sea-air was disastrous. Those cases which are most benefited by prolonged sea-voyages are those in which there is no inherited tendency to tuberculosis. Dr. Bowditch thought that a great distinction should be made in speaking of the seacoast-air and the pure sea-air. Cases which could not stand the harsh, cold, and changeable air of the seacoast may be benefited by a sea-voyage, or residence on an island some distance from the shore, where the conditions are similar to those which are obtained in a sea-voyage. Dr. Knight remarked that he knew of several patients who had improved and gained in weight during a stay at some of the coldest resorts on the New England coast. Dr. Wilson gave it as the result of his experience that there were three classes of consumptive patients who cannot go to the Atlantic seacoast without risk: (1) those in whom there is active febrile disturbance, (2) those who have a highly excitable nervous organization, (3) those who suffer from repeated attacks of spitting of blood.

BRAIN-WOUNDS. — At a meeting of the American Surgical Association held in Washington, Dr. D. Hayes Agnew of Philadelphia discussed the medico-legal aspect of wounds of the brain and thorax. The study of the subject was suggested by a recent case which occurred in Newport, in which a colored man was found dead under the breakfast-table. He had food in his mouth, and a wound of the head and the heart. The question was as to the possibility of these wounds being self-inflicted. Dr. Agnew, after a thorough examination into the subject, states that injury to the brain is not necessarily followed by loss of consciousness or paralysis. Numerous instances have occurred in which, after injury to the heart, the individual had performed many acts. He concluded that it is possible for a ball to enter the brain without destroying consciousness, although for a moment it may cause mental confusion, and that a suicide may shoot himself in the head, and after a moment shoot himself in the heart. In the particular case which gave rise to the discussion, it was demonstrated that the deceased had been murdered, his son-in-law confessing the crime.

BOOK-REVIEWS.

The Effect of the War of 1812 *upon the Consolidation of the Union.* By NICHOLAS MURRAY BUTLER, Ph.D. Baltimore, Publication Agency of the Johns Hopkins University.

A VERY interesting subject is treated with tantalizing brevity in the monograph which forms the seventh number in the fifth series of the 'Johns Hopkins University Studies in Historical and Political Science.' Dr. Butler has confined himself wholly to one line of investigation, avoiding the many fascinating questions that are collateral to it, and freeing his own discussion of the main subject from all but the very briefest comment. He desires to show, first, that real peril to the perpetuity of the Union sprang from the anti-nationalistic theories broached in the first decade of the present century; and, second, that the immediate effect of the war of 1812 was so to stimulate national pride and strengthen the waning desire for national unity as to avert that peril until it confronted the State once more at a later day, allied with the political interests of slavery.

The term 'anti-nationalistic,' which Dr. Butler uses, serves a very convenient purpose; for it cannot be truly said, that, as a practical factor of national politics, the doctrine of State sovereignty was more the property of the Democratic than of the Federal party. It was really a question between the ins and the outs. Although the first clear statement of the principle of State sovereignty is found in the Virginia and Kentucky Resolutions, and hence must be regarded as Democratic, still, in the practical application of that principle, the Federalists of the Massachusetts and Connecticut Legislatures and of the unfortunate Hartford Convention were not a whit behind their old opponents; and Dr. Butler makes it very clear, that, until a foreign war had drawn the popular attention away from internal dissensions to the public peril, neither party was truly animated by a consistent and continuous desire for genuine union. That the war of 1812 was in its inception a party war, is, of course, quite true; yet in 1816 the people, as a whole, made it evident by their votes that they had united in approving it, and that they rejoiced, with a thrill of national pride that was wholly new, over the brilliant victories of the American navy, and of Jackson's army at New Orleans. Of this curious change in popular sentiment, Dr. Butler gives us much interesting corroborative testimony, and, strangely enough, from men of the same party that first paved the way for the later doctrines of Calhoun and Hayne.

"The war," says Dr. Butler, "had ruined the particularists: it had made all nationalists, if we may use the word. The bonds of the early days of the Revolution were forged anew, and the

nation's heart beat as one. Patriotism and national pride had conquered sectionalism and personal selfishness. The era of good feeling had dawned."

It may seem to the general reader that the author regards the beneficial effects of the war as wholly transient and temporary, — good while they lasted, but soon to be entirely obliterated: in other words, that the sentiment of nationalism which then made itself apparent was a thing of present interest rather than of permanent importance. "Although *not destined to be permanent*," says Dr. Butler on p. 26, "the national feeling it produced was something entirely novel." "The ebb was to be greater than the flow," is another expression that may mislead. But the author clearly does not mean to ignore the fact that the war of 1812 did, in truth, lay the foundation for that imposing constitutional structure which Webster and his followers were to build, and which fell not in the time of trial, being founded on a rock. In fact, from the year 1816 begins the true development of a party devoted to the preservation of the Union; and if Dr. Butler does not follow out this line of thought, it is because he has distinctly limited his discussion to the consideration of the immediate results, and declined to enter upon investigations too extensive for the pages of a monograph.

H. T. P.

The Principles of Morals. By Professors FOWLER and WILSON. Oxford, Clarendon Pr.

TREATISES in ethics seem more numerous in the last decade than in any other. The revival of interest in this subject reminds us of the emergencies that called forth the moral earnestness of Plato. Indeed, the revolution going on in present ethical speculations is a repetition of the sophistic movement in Greece, and seems to provoke similar reconstructive efforts. But the task this time is a greater one than that with which earlier moralists had to contend.

The successors of Professor Green follow that lamented author's 'Prolegomena' with a very different discussion of ethical problems. The work is the joint product of two authors, and consists of two parts. The introduction is mainly historical, but contains sufficient criticism to determine the position of the writers. It is admirably free from the long and labored discussions about pleasure which make so many systems of ethics tedious and useless. Only a few pages are devoted to methods of ethics, the authors not being willing to repeat the satisfactory work of Mr. Sidgwick, with whom they substantially agree. The second part is a pointed and direct discussion of those questions having an immediate interest for present speculative morals. Theories of ethics, that limbo of wasted energies, are entirely abandoned for the psychological examination of moral facts as they appear in the life of the individual and of society. A characteristic feature of the work is its unconscious betrayal of the immense influence exerted upon ethical conceptions by modern scientific thought, and especially by the doctrine of evolution.

The decline of theology, and of conceptions of life founded upon it, has disparaged the theonomic view of morals as advocated by men like Bishop Martensen; and a re-action against such ethics, led by the principle of evolution, has forced into great prominence the consideration of self-regarding impulses to action. The first chapter shows this very distinctly. The last completes the separation between theology and morals.

There is an important remark in the chapter on self-regarding feelings which is the keynote to all social and moral questions of the present time. It is this: "While man lives from hand to mouth, the want of the necessaries of life, the hard struggle for existence, leaves neither leisure nor inclination for the development of the higher faculties." Professor Green makes a similar remark: "Until life has been so organized as to afford some regular relief from the pressure of animal wants, an interest in what Aristotle calls τὸ εὖ ζῆν, as distinct from τὸ ζῆν, cannot emerge." This means that moral life requires relaxation from perpetual and exhausting toil in order to be realized; and modern ethics have become conscious of the fact that large portions of the human race have not, and perhaps cannot expect, this exemption. What, then, about moral life where the industrial classes are condemned to employments that make it impossible? There is a tincture of pessimism latent here, and the unfortunates of modern social life are learning the real causes of their deplorable condition: like Enceladus, they are trying to turn over, and to relieve themselves in their uneasy position. The inequalities of the present cannot be postponed to the future for adjustment, and egoistic instincts are likely to assume an arrogance which theological beliefs once effectually suppressed. Modern civilization is slumbering upon a volcano, and reminds us of Carlyle's allusion to Vesuvius: "The earth, green as she looks, rests everywhere on dread foundations were we further down; and Pan, to whose music the nymphs dance, has a cry in him that can drive all men distracted." Self-regarding impulses may become dangerous: still no progress is possible without them, and the marvellous recuperating forces of human nature will always bring up the unexpected and the impossible; so that, amid impending consequences of the most threatening kind, there may be the promise of escape and security.

The discussion of the sympathetic, the resentful, and the semi-social feelings is able and suggestive. The freedom of the will is dismissed in much the same way as it is disposed of by Bain and Sidgwick. There is an interesting chapter on the relation of the imagination to moral ideals. The style is like that of most English writers at present, except Mr. Martineau, heavy, and uninteresting, — a great fault in subjects which are fast acquiring such supreme importance.

NOTES AND NEWS.

AT the recent Royal Academy banquet, Professor Huxley concluded his speech thus: "Art and literature and science are one; and the foundation of every sound education, and preparation for active life in which a special education is necessary, should be some efficient training in all three. At the present time, those who look at our present systems of education, so far as they are within reach of any but the wealthiest and most leisured class of the community, will see that we ignore art altogether, that we substitute less profitable subjects for literature, and that the observation of inductive science is utterly ignored. I sincerely trust, that, pondering upon these matters, understanding that which you so freely recognize here, that the three branches of art and science and literature are essential to the making of a man, to the development of something better than the mere specialist in any one of these departments — I sincerely trust that that spirit may in course of time permeate the mass of the people; that we may at length have for our young people an education which will train them in all three branches, which will enable them to understand the beauties of art, to comprehend the literature, at any rate, of their own country, and to take such interest, not in the mere acquisition of science, but in the methods of inductive logic and scientific inquiry, as will make them equally fit, whatever specialized pursuit they may afterwards take up. I see great changes: I see science acquiring a position which it was almost hopeless to think she could acquire. I am perfectly easy as to the future fate of scientific knowledge and scientific training: what I do fear is, that it may be possible that we should neglect those other sides of the human mind, and that the tendency to inroads which is already marked may become increased by the lack of the general training of early youth to which I have referred."

— Simultaneously with the appearance of the report of the Seybert Commission on Spiritualism, the J. B. Lippincott Company publish a volume by John Darby (Dr. Garrettson) with the rather peculiar title, 'Nineteenth-Century Sense: the Paradox of Spiritualism.' The first fifty pages of the book are printed in small type, and describe a series of very wonderful experiments in 'transcendental physics,' the writing on slates by unseen hands, the slipping of iron rings upon firmly bound arms, the tying of knots in an endless rope, materializations and visions, and so on, all performed with the assistance of a member of the Seybert Commission. These are recorded with all the enthusiasm and interest of a believer, when suddenly we are told that his confrère confided to him how all had been done: it was sense-deception, trickery and nothing else. From this on, such manifestations have nought to do with Spiritualism. We now enter a higher sphere and a larger type. The author is a Rosecrucian (so he tells us), and uses the word as meaning an illuminatus. He has had revealed to him the inner meaning of things, and lives in a different world. He then ex-

pounds his theories in a language full of incomprehensible cant, glorying in paradoxes, flying from one topic to another at a most erratic gait, and beginning and ending nowhere. The whole is strongly suggestive of a semi-morbid condition of mind, and will probably have a charm for minds of neurotic temperament that delights in the apparent and exclusive possession of an un-understood mystery. The redeeming point of the volume is its refusal to ally itself with coarse, physical deceptions, and thus gives no opportunity for preying upon the liberality of the credulous.

— The changes in the elevation of the Caspian Sea and the Baltic have been discussed by Dr. Brückner in a lecture delivered at the meeting of the German Meteorological Society at Karlsruhe, and by W. Seibt ('Das Mittelwasser der Ostsee bei Travemünde'). Both authors show by their separate methods that the influence of the wind upon lakes has been overrated, and that the annual rainfall regulates the amount of water in lakes and seas communicating with the ocean through narrow channels. The amount of water carried by the Volga regulates the elevation of the surface of the Caspian Sea, and the same is the case with the Black Sea and its affluents. Brückner shows that the easterly winds of May and the westerly winds of July and August have an influence upon the Baltic, but the thorough discussion of the gauge observations at Travemünde by W. Seibt proves that only in April, May, and September the height of the water corresponds to the direction and pressure of the wind. It appears that the volume of water of the Baltic is subject to periodical changes. While Brückner believes that this is entirely due to the changes of the annual rainfall, Seibt concludes that a periodical annual tide exists in the ocean, which is observed only in seas in which the daily tide is insignificant.

— Over 60,000,000 caterpillar-cocoons were destroyed on the trees in Washington during the spring, so that the city will not suffer from this pest this year as badly as formerly.

— U. S. Consul Siler at Cape Town, Africa, has sent to the Department of State an interesting report on leprosy in South Africa. He says that he has recently read in American papers of the existence of leprosy on the Pacific coast, with expressions of fear that the disease may become general. The disease, he states, is not uncommon in South Africa.

— The sitting statue of Bowditch the navigator, executed in 1847 by Ball Hughes, and long one of the most celebrated monuments in Mount Auburn cemetery, Cambridge, has just been replaced by a new casting from the foundry of Gruet jeune of Paris, the old showing some signs of injury due to defective founding.

LETTERS TO THE EDITOR.

*** The attention of scientific men is called to the advantages of the correspondence columns of* SCIENCE *for placing promptly on record brief preliminary notices of their investigations. Twenty copies of the number containing his communication will be furnished free to any correspondent on request.*

The editor will be glad to publish any queries consonant with the character of the journal.

Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

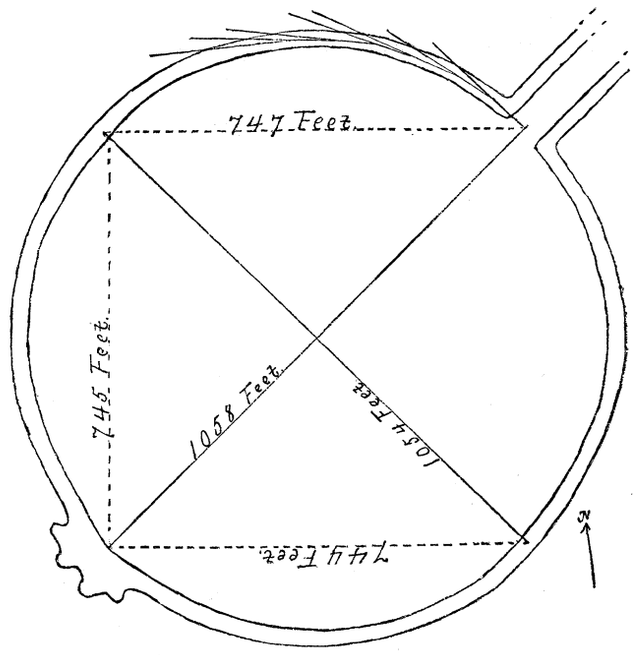
Ohio Mounds.

HAVING recently made a survey on behalf of the Bureau of Ethnology, of some of the circles of the ancient works of Ohio, I wish to call attention, by permission, to one or two facts brought to light.

This can best be done by an illustration, for which purpose the 'Observatory Circle' of the works at Newark, Licking County, is selected (see 'Ancient Monuments,' by Squier and Davis, Plate xxv. F.).

Running this by means of short chords of seventy-five feet in length, taking the middle line of the top of the wall, I found the number to be 44, and twelve feet in addition, or the perimeter of the polygon 3,312 feet. The course of each chord was taken. While the variation from one to the other, if the figure were a true circle, should be about 8° 9′, it was found to vary from one to fifteen degrees. But, somewhat to my surprise, it was found that these variations compensated each other in short distances, so that in measuring the quarters they almost wholly disappear, the angle of the first quarter being 44° 52′, and its chord 747 feet; the angle of the second quarter 45°, and its chord 745 feet; of the third quarter, 44° 52′, and the chord 744 feet; the fourth quarter was not measured owing to obstructions. It is therefore apparent that the figure as a whole is very near a true circle.

But the most singular fact is presented by the diameters. These, as taken by careful measurements from the quarter-stations, are



respectively 1,054 and 1,058 feet, the average of which is 1,056 feet, precisely sixty-four poles, or sixteen chains.

As there are several other circles of the size, this singular coincidence is, to say the least, interesting. JAMES D. MIDDLETON.

Youngsville, Penn., June 22.

Waterspouts.

BELIEVING that every natural phenomenon, especially when unusual or little studied, is worthy of record, we have put down a few notes about a series of waterspouts which passed here on Monday, May 23, shortly after noon. One of us saw at one time, from an elevation of about one hundred and fifty feet, as many as nine in various stages of their formation; the other, eight, at an elevation of fifty feet, we being about half a mile apart; and some persons claim to have seen twelve in all.

Alassio is situated on a bay, or rather roadstead, which is about five miles from headland to headland in a straight line: from that line to our villas is at least two miles.

On the 22d there was a severe storm throughout north Italy, extending from Padua to Turin, accompanied by hail and frost. The mountains behind Genoa, and all along the coast, were again covered with snow. This storm appeared to divide, and while going through the mountains to the north, not seen from here, passed us about three miles out at sea, at about 11 A.M. Then there was no wind; the sea was unusually smooth in the bay, but the line of the storm was strongly marked, and the roaring of the waves was distinctly heard. A little later we had a very slight shower.

The morning of the 23d was unusually electrical, so much so as to make every one feel uneasy and restless. The wind dropped, and there was a dead calm. At a little after twelve we were called out by our gardeners and servants, and, looking out at sea, saw a long black cloud lying in a straight line across the bay, from which long descending tubes — some straight, as if drawn with a rule, others twisted like snakes — were moving rapidly in procession in a south-westerly direction. The surface of the sea boiled, and the foam and spray rose many feet into the air with a loud roaring plainly heard on land. In some cases, as these tubes approached the sea with their dangling ends, the water seemed gradually to rise and meet them. In other cases the ends swayed to and fro above the waves, either forming no connection with them, or having already begun to break up. In nearly every case the

hollow tube was distinctly visible, the centre being clear like glass, while the outside was wrapped in a smoke-like mist. Even with the naked eye we could distinctly see a spiral motion on the inside of the tube, as if water were either ascending or descending, in which direction it was impossible to tell. Beyond the waterspouts, between the cloud and the sea, a blue sky with sunlit cumulus clouds was plainly seen. These tubes moved at the rate of more than thirty miles an hour, judging from the time ordinarily taken by steamers in crossing the same space. Estimates of the height of the cloud are difficult to make, but at least half the tubes were seen over the promotory of Capo delle Mele, which is about one thousand feet high, and distant about five miles, as the crow flies, from the point of observation.

The phenomenon caused a great panic among the inhabitants, owing to the prediction of Falb that there would be a violent earthquake on that day.

There was subsequently a slight storm of hail and rain; but farther westward, on the coast, the damage done was considerable, at San Remo secular olive trees being torn up by the roots and whirled away. No waterspout is, however, known to have burst on the land.

MAURICE HOWARD,
EUGENE SCHUYLER.

Alassio, Riviera, Italy, May 26.

How to make Meteorological Observations at a Distance above the Earth's Surface.

THE progress of meteorology in the beaten tracks of the usual observations is very satisfactory; but there are several new lines of work, that can be and ought to be carried out, that receive scarcely more than an occasional mention, or a regret that somebody does not do something in the matter. The observation of the conditions of the atmosphere above the earth's surface is perhaps the most important of these questions. I know of no meteorological data so much to be desired as that which is now obtained for short, irregular intervals, by the occasional ascent of a balloon. This, however, is a very expensive and risky method of observation, and has always been looked upon as a novelty rather than a regular method.

The few observations made in balloon-voyages, together with those obtained by means of an occasional captive-balloon ascent, are very valuable, and have been used over and over again in determining constants. The great expense of even a captive balloon, where the observer must go up, has prevented their general introduction into meteorological work.

It has often been proposed to send up self-registering instruments in smaller captive balloons; but, if this has been done, I have not seen accounts of it. The lighter forms (metal thermometer and aneroid barometer) could undoubtedly be used in this way; but the ordinary registering-apparatus is very delicate, and the swaying of the balloon might disturb the adjustments; besides, the original cost of the apparatus is considerable, and, moreover, any damage could not be easily repaired.

In place of a balloon, the kite has been suggested, and E. Douglass Archibald has made some interesting preliminary experiments with this method.

I have seen only the account of his experiments as given in the *Meteorologische Zeitschrift* for 1885 (p. 47); but in this paper there are references to *Nature* (Nov. 20, 1884) and *Quarterly Journal* (January, 1883).

Mr. Archibald flies two kites, the one to steady the other. He carried on systematic observations with an anemometer (six inches in diameter) for a year, and finally got results for a height of eleven hundred feet above the ground.

I saw this paper on Mr. Archibald's work a few days ago for the first time; but it interested me very much, as I had been considering the same problem. A year and a half ago I devised a form of apparatus that would seem to promise good results; but it was only some months ago that I suggested the following detailed construction, which is given here for the benefit of any who might wish to carry on any such experiments.

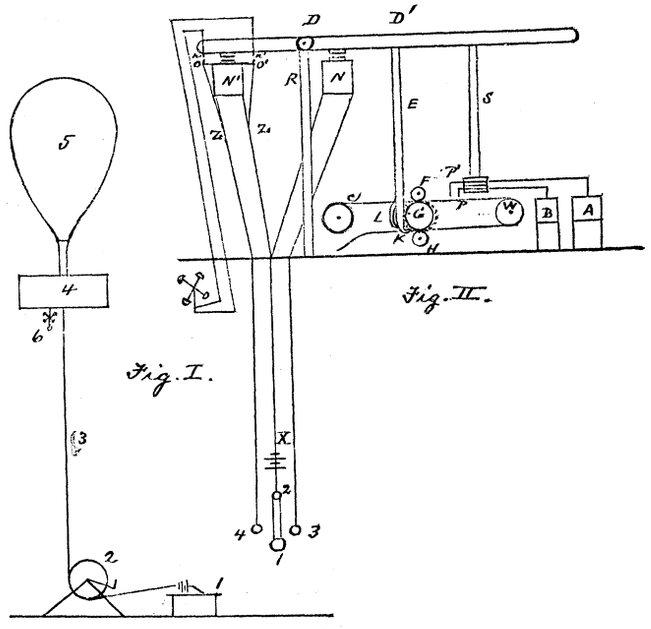
The general form is seen in Fig. 1, and consists of a balloon (5) which carries a basket (4) suspended from beneath, and the basket carrying an anemometer (6) with a weight below it.

The balloon is held captive by a three-strand (insulated) wire, which is wound around a reel (2), and passes to a table (1), where the battery and keys are mounted.

The reel (2) must be firmly anchored, and the wires arranged so there will be no danger from electric currents. A cloth ring, with the length of rope (from the balloon) written on it, can be glued to the rope at every hundred feet, so that the observer can see just how much rope is out; and, by means of some instrument for measuring vertical angles, the altitude of the balloon can be measured and the height of the balloon computed.

The apparatus as shown in Fig. 2 might also be sent up in a balloon held captive by an ordinary rope, if a small bichromate-of-potash battery, with closed hard-rubber cells and a clockwork to break the circuit every five or ten minutes, is also included. The whole apparatus might also be sent up on a kite, if one wished to risk the instruments, which would be destroyed by the sudden falling of the kite.

The method here given allows the observer to control the time of observation, and would seem best on that account. The registering apparatus as shown in Fig. 2 is practically Professor Wild's system, with some important differences, however. I was for a long



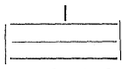
time troubled about the means of moving the registration-paper without clockwork, but Wild's method answers the purpose very well. It must be borne in mind that only a very general description of the apparatus is given here.

The following apparatus is to be placed in the basket suspended from the lower end of the balloon. The basket must be so arranged that the air will have free passage through it when the balloon is ascending or descending. The balloon need only be large enough to carry a few pounds (fifty) to the height of half a mile: it is impossible to foretell just how much the whole apparatus would weigh. A hair hygrometer could also be added to the instruments, but has not been put in the accompanying sketch.

The careening of the balloon would have no effect on the working of the apparatus as shown here, because nothing of the registration arrangement is free to move except the pointers. In making an apparatus, the best arrangement would be somewhat different from the sketch given here.

The main advantage of this apparatus is the cheapness with which an ordinary aneroid barometer and metal thermometer could be applied to the purpose.

In Fig. 2, R is a stand on which the long lever D rests, and turns in the vertical. N and N' are two electro-magnets which attract D. When the key 1 joins 2-3, then N acts, and draws D down on the right. When the key 1 joins 2-4, then N' acts, and pushes D up on the right. Self-registering paper is coiled on the wheel c, and one end of the paper passes between the rollers F and G, and then

over the roller *W*, and then between the rollers *G* and *H*. The rollers *F* and *H* are the same size; but *G* is larger, and has a ratchet-wheel at its end. *E* is a rod joining *D* at *D'*. At the lower end of *E* is a ratchet-catch *K*, pressed upon by the spring *L*, which is also fastened to *E*. *S* is a rod fastened to *D*, and has on its lower end a wide framework  composed of horizontal slats. Between these slats pass the indicator or pointer of an aneroid barometer *B*, and a metal thermometer *A*. These pointers are made longer than usual, and have attached a needle-point at right angles in the vertical, as shown by *P'* and *P*. This whole apparatus is mounted on a frame or board, and put into a basket suspended from the lower end of a balloon. The three wires below are fine wrapped wire, and serve to hold captive the balloon as well as to cause the self-registrations to be made, by aid of the battery *X* at the ground. Let the balloon ascend, say 100 feet; then put 1 on 2-3, and *N* draws *D* down. This pushes *E* down (and the ratchet-catch glides over the teeth on *G*), and pushes *S* down also. This last causes *P'* and *P* to puncture the paper. Now open 2-3 and close 2-4; then *N'* draws *D* up, *S* is pulled up, and the points *P'* and *P* are freed. Also *K* catches on *G*, and draws off some paper from *c*, the paper being drawn between *F G*, over *W*, and between *G H*. Then the holes pricked by *P' P* are out of the way, and other holes can be punctured at another elevation of 100 feet for the balloon. A fixed pencil is also pressed against the paper at each observation, as a reference-point for the puncture by the index-point.

For the hair hygrometer we should have another pointer, *P''*. A small anemometer can be suspended from beneath the basket, and kept vertical by means of a weight. This anemometer causes a contact arrangement to close for an instant for every 100 feet of wind-motion. The two wires from the anemometer terminate at *n* and *n'*, and, when the magnet *N'* is not attracting the armature, the points *n* and *n'* are free. When the current is passed through *N'*, then *n* comes in contact with *o*, and *n'* in contact with *o'*; *o* and *o'* being joined to the wires 4 and 2, which run to the reel at the ground. At the ground we insert a telephone or a galvanometer in the wire 4.

The normal condition of the apparatus will be with the current passing through *N'*, and the battery *X* will cause the galvanometer to give a constant reading; but, for every hundred feet of wind, the anemometer will close its circuit for an instant, and the dividing-up of the current at *Z Z* by including the anemometer in the circuit will cause a momentary deflection of the galvanometer (or will cause a slight sound in the telephone), and the observer can time these with a watch, and get the wind-velocities whenever he wishes them.

In place of *N* we could insert a spring, and do away with the wire 3, and probably various other changes would suggest themselves to any one actually constructing the apparatus.

FRANK WALDO.

Cincinnati, O., June 27.

Sea-sickness.

WITH regard to the subject of sea-sickness, treated of in an article in *Science*, June 3, I beg to offer a few remarks.

As to the causation of the affection, the process is a gradual one, affecting the balancing sense, which is not interfered with in the case of iron-plate workers. The sickness affecting these workers is caused by the successive shocks due to the hammering, and differs from sea-sickness in character and causation.

An article of mine in the *Lancet* of June 28, 1884, defines sea-sickness as follows: "The altered sensory impressions affecting those at sea interfere with the co-ordination of movements by which the body is adapted to its surroundings, and with the vomiting and other centres in the *medulla oblongata*. This interference causes sea-sickness."

The balancing of the body depends on the ordinary sensory impressions, and also on what Foster calls 'the afferent impulses, as it were, of a new sense,' from the semicircular canals, arising from variations of pressure in their ampullæ. With reference to the recent paper of Dr. James, the following quotation from my article above mentioned may be of interest: "In cases where the internal ear has been injured by otorrhœa following scarlatina or measles, we may suppose that the person learns to balance himself without the intervention of this new sense, the absence of which is compensated for in some way; and it is a curious fact, and one which throws considerable light on the etiology of sea-sickness, that such persons invariably escape this disease. . . . That deafness in itself does not prevent sea-sickness is in keeping with the fact that the afferent impulses from the semicircular canals do not give rise to auditory sensations" (*vide* Foster's 'Physiology,' 2d ed. p. 495).

It is reasonable to believe that no structural change takes place in the semicircular canals, due to the motion of the endolymph, else the longer the motions continued, the more marked would become the sickness. The altered impressions affect the brain directly, and sea-sickness is prevented by their action from being mollified or nullified by the educated conscious ego.

As to drugs, atropine has a sedative action on the *medulla*, etc., and renders the altered sensory impressions inoperative in producing sea-sickness. It should be given in drop doses of the liquor atropine, B.P., in a teaspoonful of water, every hour, till the physiological effect of the drug is produced.

The bromides have also a sedative action on the brain, but, to prevent sea-sickness, must be given in sufficient doses to produce bromism. As this is a serious condition, and one likely to affect the patient's reason and general health most injuriously, the bromides should be used with great caution, and only when prescribed and their action watched by a medical man.

T. T. REYNOLDS.

Steamship 'City of Chicago,' Jersey City, July 1.

The Function of Nitrogen in Manures.

IN works on agricultural chemistry it is usual to classify manures or plant-food substances as nitrogenous matter, phosphates, and potash; but, while the phosphates and potash enter into the substance of every part of the plant, the amount of nitrogen found in the cereals and food-plants generally is inconsiderable.

A few food-plants contain nitrogen as an essential element of their substance: thus pease contain from two and a half to three and a half per cent, and tea-leaves from five to eight per cent; but in the case of all these plants it is well known that they are capable of drawing the necessary supply of nitrogen from the atmosphere.

Without entering on the question of whether the small traces of nitrogen found in the substance of food-plants generally are essential or accidental, or that other question whether all plants requiring nitrogen are, like animals, capable of deriving it from the air, it is very safe to infer, from the slight trace of nitrogen found in the cereals and food-plants generally, that the ammonia, or nitrogenous substance convertible into ammonia, which is necessary to secure a good crop, has some other and more important function to perform than that of supplying nitrogen to the plant. It may be doubted, even, whether nitrogen is a plant-food for the cereals, or in any way essential to their proper development; but hydrogen, the other element of ammonia, is one of the prime constituents of all vegetable substances, and I infer that it is the easily liberated hydrogen in the ammonia that gives it its manurial value. The function of the nitrogen is simply that of a carrier of hydrogen.

Let me explain. The substance of all trees and plants, wood, stalk, bark, leaves, fruit, etc., is a chemical compound of the three elements, oxygen, hydrogen, carbon. The tree or plant absorbs carbonic acid from the air, which gives it two of the three essential elements, carbon and oxygen. It also takes up water, which is a compound of oxygen and hydrogen, by the roots; and by the mysterious chemistry of organic life, the water and carbonic acid being decomposed on contact, the liberated hydrogen and carbon unite with a portion of the oxygen into definite chemical combinations, the new substance arranging its atoms as cell-contents or cell-walls. All the oxygen of the water, with a portion of that from the carbonic acid, is liberated, and returned to the atmosphere. Given air, water, and potash, and a soil mechanically suitable, and we have all that is necessary to the full and healthy development of timber and fruit trees, flowering plants, and in fact almost every species of vegetation except the grasses, cereals, and principal food-

plants, which cannot be grown under similar conditions. The fact that they will grow freely in soil containing ammonia, or decomposing animal matter convertible into ammonia, led to the conclusion that they wanted nitrogenous food. The fact that the nitrogen is not an important element of their substance at any period leads me to infer that these plants are incapable of decomposing water, and consequently dependent for their necessary supply of hydrogen upon ammonia or some other compound of hydrogen more readily decomposed than water. It is well known that while the nitrates of potash, soda, lime, etc., are all valuable auxiliaries to farmyard manures, they are of no value as a substitute for it. Very eminent chemists have been somewhat staggered at the results of their experiments in this direction; but precisely as the function of nitrogen in ammonia is to carry hydrogen, so the function of the nitrogen in the nitrates is to carry potash. Whether we dress the soil with nitrate of soda, lime, or potash, the result is the same. With potash salts in the soil, the addition of the nitrates of soda or lime leads to a double decomposition, and the conversion of the potash into nitrate. Sulphates and chlorides of these bases appear to have some small value as manure, although their composition remains unchanged; but in the mysterious laboratory of the growing plant the nitrate of potash is resolved into its elements. The potash allies itself with carbonic acid to form carbonate, or with carbon, oxygen, and hydrogen in various proportions to form the organates of potash (the citrates, tartrates, oxalates, etc.), so important to the development of fruits.

Whether we employ ammonia or the nitrates as manure, the nitrogen is liberated in the plant to unite with oxygen, and be radiated as common air. In the one case, hydrogen remains; in the other, potash.

The current theory of nitrogenous manure appears to be based on a complete misconception as to the function of the nitrogen in its various compounds; and when it is once clearly realized that hydrogen is the important food-substance yielded by ammonia, it will be of practical interest to determine whether this substance cannot be supplied more economically by the decomposition of water *secundem artem*.

C. F. AMERY.

Geological Questions.

THE replies to the following questions by some of the most eminent American geologists have induced me to ask your assistance in getting a wider circle to consider them. They were framed for the purpose of enabling the writer to properly represent American thought on the subjects mentioned, in his report on the Archaean to the American Committee in August next. Those geologists who are willing to render the undersigned the valuable assistance of expressing their opinions on the matters involved, are requested to write the letter of the question, and give the answer as laconically as is consistent with a clear statement of their views. In alternative questions, like J or N, it will suffice to append the numbers of the clauses representing their opinions.

A. Do you agree to the suggestions contained in the report of the International Committee on Nomenclature ('Report of the American Committee on the Work of the Geological Congress,' pp. 49 to B, p. 57)? Please state explicitly if you are willing to accept the recommendations of the congress.

B. Do you favor the division of the Archaean Group into a definite number of systems? If so, give their names and the order of their succession.

C. Give the horizons of non-conformability in the Archaean.

D. Do you approve of the plan of subdividing the Archaean petrographically and of omitting corresponding chronological divisions and names?

E. Should the eruptives occurring in the Archaean rocks be classified with the latter, or separately?

F. Which, if any, of the following terms is applicable in American geology, and how applied? 'Hebridean,' 'Dimetian,' 'Arvonian,' 'Pebidian.'

G. Are there crystalline rocks in, and after, the Paleozoic lithologically indistinguishable from those of the Archaean?

H. Are there any crystalline rocks in the Archaean which do not occur later?

I. Is mineral constitution indicative of geological age?

J. Are the lower stratified crystallines: (1) of aqueous origin metamorphosed partly, or wholly, by igneous action; (2) of igneous origin metamorphosed in part, or in whole, by subsequent agencies; or (3) partly one and partly the other?

K. Are there evidences of organic life in the Archaean; if so, where, and what?

L. In your opinion, is Eozoon Canadense of organic origin?

LL. Do you approve the European map committee's (Professor Lossen's) system of coloring and classifying the eruptives?

M. Should Serpentine constitute one class of eruptives?

N. Is Serpentine, (1) sometimes, or (2) always an alteration product: (3) of eruptives, (4) of sedimentary rocks, or (5) of either?

O. What, in your judgment, is the proper disposition of the term 'Taconic?' If employed, what are its limits, and what terms should it replace?

P. How should the Cambrian be divided?

Q. Are 'Menevian,' 'Ordivician,' or any other more or less comprehensive foreign names, applicable in American geology? if so, how?

PERSIFOR FRAZER,
Reporter for Archaean.

Philadelphia, 201 South Fifth St., July 9.

The Charleston Earthquake.

IN reply to Prof. Joseph Le Conte's valued criticism (*Science*, x. p. 22), I would say that it seems to me that the method for estimating the depth of an earthquake-focus proposed by Mr. Hayden and myself differs radically from that proposed by Mallet in the 'British Association Report' of 1858. His inference that the horizontal motion has a maximum value where the 'angle of emergence' is 54° 44′ could be true only of normal waves. It cannot be true of the transverse waves. He ignores the transverse waves entirely in his formula; and the omission, I maintain, is fatal to its applicability. He also ignores the vertical component of the normal wave, which at such an angle is much more energetic than the horizontal component. What proportion of the horizontal motion is due to the normal waves can generally be determined at considerable distances from the origin when the facts upon the ground are clearly manifested. But at the very localities where such a determination is necessary for the application of Mallet's method the difficulty is greatest. It is just here, too, that all the components, vertical and horizontal, normal and transverse, blend together with such effect that not one of them can be ignored without fatal error. We must consider their total effect. But these motions compounded represent the intensity, i.e., the amount of energy per unit-area of wave-front. Mallet's 'circle of greatest destructiveness' has no real existence. It is a purely mathematical abstraction obtained by postulating conditions which do not have any separate existence.

Since writing the above, I have recurred to Mallet's paper, and find the following: "It is certain that in all great earthquakes the real mischief and overthrow at places pretty far removed from above the centre of impulse are done by the blow from the normal wave, which appears to come first; hence, the main observable effects are those of the normal, and we are justified and enabled, *in such localities*, to neglect the transversal. But within a considerable circle of area, whose boundary is evanescent, and whose centre lies at the point right above the origin, the actual effects of the transversal wave are very formidable, and can never be neglected." [Then why should he have suggested doing so?] "The ground beneath an object so situated, such as a house or pillar (as the distance from the origin to the surface is the minimum range of emergence, or shortest possible, and its energy therefore the greatest), is almost at the same instant thrown nearly vertically upwards by the normal wave, and at the same moment rapidly forced forwards and backwards in two directions orthogonal to each other; and this combined movement, which is that called 'vorticoso' by the Italians and Spanish Mexicans, is one that nothing, however solid and substantial in masonry, etc., can long withstand."

It is certainly a pleasure to find Mr. Mallet reasoning so justly; but in the remarks quoted it is apparent that he is taking account of

all the components of motion; which must give us the true intensity in just the sense that this term is employed by Mr. Hayden and myself. Its graphic representation will be the curves we have given and no other.

Professor Le Conte remarks: "We have assumed all along that the intensity or excursion of the earth-particle, or the height or amplitude of the wave, varies inversely as the square of the radius of the agitated sphere. The authors as well as other writers assume this law." Here he evidently misapprehends. It is indeed assumed that the intensity varies inversely as the square of the distance, but the amplitude varies (subject to later qualification) in a simple (not duplicate) inverse ratio with the distance. The intensity for a given wave-length is proportional to the square of the amplitude; for, by Hooke's law (*ut tensio sic vis*), the time of vibration of a particle in an elastic wave of given wave-length is uniform whatever the amplitude. Hence the mean velocity of the particle is simply proportional to the length of its path, i.e., to the amplitude. But its energy is proportional to the square of its velocity, ergo, to the square of its amplitude. Hence, too, the amplitude must be inversely proportional to the radius of the spherical wave, provided no energy is dissipated in transmission. If, then, the amplitude at Charleston were four inches, at a distance of a thousand miles it would, without dissipation, amount to about two millimetres, — a well-marked tremor.

Professor Le Conte's suggestion that the law of variation of intensity with distance may be affected by reflection back into the earth from the surface is, so far as I am aware, a novel one. That there must be some energy so reflected seems undisputable. But the portion so reflected would constitute a new wave, or series of new waves, independent of those already in progress. It would thus add to the number of waves without affecting the energy of those already in progress, except at points of coincidence or interference.

Seebach's method of finding the depth was objected to, because it requires a degree of accuracy much beyond the highest we can hope to attain. The speed of an earthquake-wave is enormous (the time-observations obtained for the Sonora earthquake give a very high wave-speed; they are not as yet fully examined and discussed, but the preliminary examination indicates a speed about the same as that obtained in the Charleston earthquake), the space-intervals at which the time-records must be made must be short, and the time-intervals correspondingly so. The data really needed are differences in these time-intervals; and these differences would most certainly be much smaller than the probable errors of observation.

C. E. DUTTON.

Washington, July 9.

The Freezing-Point of Sea-Water, and the Melting-Point of Sea-Water Ice.

THE difference existing between the result from my determination of the freezing-point of sea-water (*Science*, ix. No. 228), and the accepted one as value for the same of 28°.8 F., seems to be inexplicable, unless we can assume that in the methods followed for its determination a wrong interpretation has been put on one of the results.

There can be no doubt, that, if the temperature of a body of sea-water is lowered till conglaciation takes places under slight agitation of the water, the temperature then existing at its surface will be that of its freezing-point.

On the other hand, it seems probable, that, when the determination of the freezing-point is made by means of an admixture of sea-water and its ice in thermic equilibrium, we have reached a condition that would be better described as the melting-point of sea-water ice.

Could we assume that in the change from the liquid to the solid form, in freezing, all the saline particles were taken up without chemical changes, it would be reasonable to suppose that the melting and freezing points would coincide; but if, on the other hand, we assume that in this conversion the entire saline particles have been expelled from the solid, we must conclude that part of the heat was expended in expelling these particles, for we may not imagine *any* work performed without a corresponding absorption of energy. We will have, in this imaginary case, essentially fresh-water ice; and, if we were determining the freezing-point of sea-water with ice so constituted, thermic equilibrium would be obtained at a temperature of 32°, which we should erroneously call the freezing-point of sea-water.

Granting the accuracy of these two suppositions, it seems certain that in the case when freezing takes place to the exclusion of four-fifths of the saline particles, as is the case with sea-water, thermic equilibrium will exist between sea-water and its ice at a temperature intermediate between its freezing-point (26°.7 F.) and that of melting ice (32°.0 F.), and experiment has proved this temperature to be 28°.8 F.

I would therefore predict, that, in the case where a liquid is converted into a solid by freezing, the temperature of the freezing-point of the liquid will be equal to that of the melting-point of the ice, only in the case or cases where each contains the constituents of the other in the same proportion.

W. A. ASHE.

The Quebec Observatory, July 4.

Concerning Filth-Diseases.

THROUGH the heart of the city of Baltimore, flowing southward, runs the bed of the sluggish stream Jones Falls. Eight miles northward, its waters are divided and turned into the city water-supply. Within the city, the stream is confined by handsome stone walls, which form a canal of dimensions twenty feet deep by a hundred feet wide and two and a half miles long — roughly. The canal empties into the Back Basin, a nearly stagnant pool two hundred yards wide by five hundred yards long, — which itself is connected by a short canal with the City Basin and tide water of slight activity.

In the northern suburbs, and within the city, the Falls and Back Basin receive the drainage from a territory in which dwell eighty thousand souls, roughly estimated, a considerably portion of whom is packed into a lower quarter of the city. They receive that from the Causeway and a part of Fell's Point, — quarters fairly designated slums.

The sediments in this drainage are precipitated in the lower half-mile of the Falls and in the Back Basin. Here they undergo fermentation and decay, at times giving off odors offensive indeed. It is a necessity of the situation that these sediments must be removed by dredging; and with the active officials of the dredging companies, and with their workmen, the writer has been in quite constant communication for nearly three years. These people pass their days stirring about and digging up this fermenting and decaying city garbage and mud and sewage. They live in an atmosphere loaded with offensive gases. And what of their health? With singular unanimity they declare that the occupation is a healthy one. Excepting in rare instances a case of nausea and vomiting, which quickly pass away, they have no more sickness than those in other occupations. As a matter of fact, the writer has not in nearly three years heard of any case of zymotic disease among about a hundred men engaged in this dredging.

The decaying refuse from the slums of a city, deposited in warm and nearly stagnant waters, ought to contain all manner of poisonous elements, — animal, vegetable, gaseous, or otherwise. Men stirring up and removing such material ought to sicken and die. Curiously enough, they do not — more than men in other occupations.

The writer has no knowledge as to what filth-diseases are, or are not, and has no suggestions to offer. The studies here indicated were made because the field seemed to promise a rich harvest of such diseases, but the promise has not been fulfilled so far.

WM. GLENN.

Baltimore, July 11.

Queries.

8. WHOOPING-COUGH IN THE CAT. — A Liverpool cat is reported to have contracted whooping-cough from a boy sick with that disease. For two weeks it had five or six attacks daily of the cough characteristic of that affection. Is this unusual? X.

9. BANANA, COCOANUT, AND INDIA-RUBBER. — Can any one send us lists of books on the cultivation of the banana, cocoanut, and india-rubber? J. C. E.